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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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Frank Hershkowitz

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ExxonMobil Research & Engineering Company

P.O. Box 900

1545 Route 22 East

Annandale, NJ 08801-0900

EXAMINER

WARTALOWICZ, PAUL A

ART UNIT

PAPER NUMBER

1793

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**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

<b>Office Action Summary</b>	<b>Application No.</b> 10/771,919	<b>Applicant(s)</b> HERSHKOWITZ ET AL.	
	<b>Examiner</b> PAUL A. WARTALOWICZ	<b>Art Unit</b> 1793	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 09 November 2009.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-18 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 10-17 is/are allowed.
- 6) ☒ Claim(s) 1-9 and 18 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All    b) ☐ Some \*    c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- |  |   |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892)   | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftperson's Patent Drawing Review (PTO-948)  | 5) <input type="checkbox"/> Notice of Informal Patent Application                       |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)<br>Paper No(s)/Mail Date <u>7/8/9</u> . | 6) <input type="checkbox"/> Other: _____  |

## **DETAILED ACTION**

### ***Response to Arguments***

Applicant's arguments filed 11/9/09 have been fully considered but they are not persuasive.

Applicant argues that both removing the furnace is a non-preferred embodiment and that the water gas shift reactor would have to operate in a cyclic mode as a result, which is not permitted by the claimed invention.

However, it appears that the removal of the furnace step results in a teaching of combustion occurring in the catalytic bed 6 (col. 5, lines 45-58). It is unclear how the removal of the furnace would necessarily result in the water gas shift reactor becoming cyclic. It appears that applicant is referencing column 5, lines 59-65 regarding the recycle stream 20. However, that does not appear to make the water gas shift operation cyclic as it is just a recycle between regenerative beds 2 and 8.

Kobayashi does recite that a furnace bypass is not practical because a hot valve is required. However, what if a furnace is unavailable and a hot valve is available to one of skill in the art? It appears that Kobayashi is describing what is practical based on the apparatus available. This disclosure does not render the absence of a furnace inoperable, only unpractical in certain situations. One of ordinary skill in the art would recognize to use a hot valve in the absence of a furnace, and vice versa. Disclosed examples and preferred embodiments do not constitute a teaching away from a broader disclosure or nonpreferred embodiments. MPEP 2123 (I).

***Claim Objections***

Claim 1 is objected to because of the following informalities: it appears that in claim 1, line 15, "regenerating reforming and cooling" should recite "--regenerating, reforming, and cooling". It appears that applicant is trying to claim that three parts of applicant's process are limited by pressure and temperature.

Appropriate correction is required.

***Claim Rejections - 35 USC § 112***

The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

Claims 1-9 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. The recitation of "non-cyclic" at claim 1, line 18 does not appear to have support in the specification. Applicant is requested to point to the portion of the specification for which this limitation has support.

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claim 1 recites the limitation "the regenerating reforming and cooling" in line 15. There is insufficient antecedent basis for this limitation in the claim.

Claim 18 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

In claim 18, lines 1-2, the recitation of "the fuel and the oxygen containing gas are mixed at the second end of the second zone" renders the claim indefinite. It appears that claim 10 requires that the fuel and oxygen are a mixture before entering the second end of the second zone. Claim 18 requires that fuel and air are mixed at the second end of the second zone. It is unclear what mixing is intended by claim 18 at the second end of the second zone as claim 10 requires that the fuel and oxygen are mixed prior to introduction to the second end of the second zone.

### ***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.

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2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1 and 2 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kobayashi '530 in view of Barr '835 and any one of Tonkovich '506 or Khandkar '114.

Kobayashi teach a process for producing hydrogen comprising reacting steam with hydrocarbon to produce synthesis gas and producing a regeneratively cooled synthesis gas, passing the synthesis gas to a shift reactor to increase the concentration of hydrogen, adsorbing gases other than hydrogen and recovering hydrogen, desorbing gas species with oxidant to produce hot combustion gas; and passing the hot combustion gas through the reactor bed to heat the regenerative reactor bed (col. 3, 8). Kobayashi also teach that it is known to use a pressure swing adsorber (col. 1).

Although Kobayashi does not specifically disclose carrying out the method in a "pressure swing reformer" the process carried out appears to be substantially similar. Additionally, Kobayashi teach that the pressure of the process can be elevated to a desired level by controlling flow rates of the feed streams and product streams (col. 4).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to optimize the pressure of the process, since it has been held that discovering an optimum value or a result effective variable involved only routine skill in the art. In re Boesch, 617 F.2<sup>nd</sup> 272, 205 USPQ 215 (CCPA 1980). The artisan would have been motivated to optimize the pressure by the reasoned explanation that controlling flow rates of feed and product streams to elevate process pressure is well known in the art.

Additionally, Barr teaches a process for producing hydrogen (col. 1) wherein the reforming process is carried out under pressure for the purpose of avoiding compressing costs (col. 1).

Therefore, it would have been obvious to one of ordinary skill in the art to provide a reforming process is carried out under pressure in Kobayashi in order to avoid compressing costs (col. 1) as taught by Barr.

Kobayashi fail to teach the claimed space velocity of the reaction.

Tonkovich teach a method of steam reforming hydrocarbons (col. 5) wherein the reactions are carried out at the claimed space velocities (col. 12).

Therefore, it would have been obvious to one of ordinary skill in the art at the time applicant's invention was made to provide the hydrocarbon reforming reactions are carried out at the claimed space velocities (col. 12) in a well known method of producing syngas from hydrocarbon reforming as taught by Tonkovich.

Khandkar teach a method of steam reforming hydrocarbons (col. 3) wherein the reactions are carried out at a space velocity of  $350 \text{ h}^{-1}$  (col. 19).

Khandkar also teach that manufacturer of the reformer suggests a space velocity of  $2000 \text{ h}^{-1}$  and that the cost of the catalyst is lower for higher space velocities (col. 19).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to optimize the space velocity of the reformer, since it has been held that discovering an optimum value or a result effective variable involved only routine skill in the art. In re Boesch, 617 F.2<sup>nd</sup> 272, 205 USPQ 215 (CCPA 1980). The artisan would have been motivated to optimize the space velocity of the reformer by the reasoned explanation that the manufacturer of the reformer suggests a space velocity of  $2000 \text{ h}^{-1}$  and that the cost of the catalyst is lower for higher space velocities as taught by Khandkar.

It appears that the prior art teaches a method of producing synthesis gas at a temperature in the range of temperatures used in high temperature water gas shift reactions such that regenerating, reforming, and cooling is conducted at a pressure and temperature to provide a synthesis gas stream having a temperature suitable for water gas shift reactions (Kobayashi, col. 3, 8).

Claims 3-8 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kobayashi '530 in view of Barr '835 and Towler '994 and any one of Tonkovich '506 or Khandkar '114.

Kobayashi teach a process as described above.



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Kobayashi fail to teach the claimed temperature of the flue gas exiting the reformer, the claimed temperature of the synthesis gas provided by the reforming temperature conditions.

It appears that the prior art of record teaches cooling the effluent of the reformer with a regenerating bed. (Kobayashi, col. 3, lines 40-52). Towler teaches a temperature of 700°C at the end of the reformer (analogous to the first zone of the present invention) and a temperature of 400-450°C after a heat exchange step for the purpose of providing an effluent with a suitable temperature for water gas shift reaction (cooled with water, col. 14).

Therefore, it would have been obvious to incorporate the temperature profile (400-450°C after heat exchange) in Kobayashi in order to provide an effluent having a temperature for the substantially similar method of water gas shift processing as taught by Towler et al.

Because Kobayashi teaches the interchangeability of water cooling and regenerative bed cooling, one of ordinary skill in the art would recognize that the temperature profiles taught in Towler can be achieved by regenerative bed cooling.

Towler teaches a temperature of 400-450°C after a heat exchange step (col. 14). Therefore, it appears that Towler teaches measuring the temperature after a heat exchange step and that Kobayashi teaches a heat exchange step after reforming wherein the heat exchange step is performed by cooling the effluent of the reformer with a regenerating bed (analogous to the regenerative bed zone of the present invention) (col. 3).

Additionally, Towler teach combusting waste products with air to produce flue gas (col. 6) wherein the flue gas is at a temperature of 400-800°C for the purpose of providing heat to the steam reforming and pre-reforming zone (col. 12).

Therefore, it would have been obvious to one of ordinary skill in the art at the time applicant's invention was made to provide wherein the flue gas is at a temperature of 400-800°C in Kobayashi in order to provide heat to the steam reforming and pre-reforming zone (col. 12) as taught by Towler.

Kobayashi teaches that the effluent of the reformer can be treated with a heat exchange process including water cooling and regenerative bed cooling (col. 3).

Additionally, Kobayashi teach that it is known to use pressure swing adsorption process to separate hydrogen from other gases (col. 1).

Kobayashi also teaches that at least part of the flue gas is recycled to the reformer (col. 5-6, fig. 2) and teach a process for producing steam using indirect heat exchange (col. 3).

Therefore, it would have been obvious to use at least part of the flue gas created in the combustion process to produce steam because the flue gas is used in heat-exchange processes and because steam is created in the process using indirect heat exchange.

Additionally, it would have been obvious to use the regeneratively cooled flue gas to form steam as the regeneratively cooled flue gas would be capable of forming steam through heat exchange.

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Claim 9 is rejected under 35 U.S.C. 103(a) as being unpatentable over Kobayashi '530 in view of Barr '835 and any one of Tonkovich '506 or Khandkar '114 and Hirata '239.

Kobayashi teach a process for producing hydrogen as described above.

Kobayashi fails to teach that the air provided in the regeneration cycle is compressed air.

Hirata teach a turbine and reformer system (col. 1) wherein fuel is combusted with compressed air (col. 3) for the purpose of providing electricity and providing means for raising the temperature of the reformer (col. 3).

Therefore it would have been obvious to one of ordinary skill in the art at the time applicant's invention was made to provide fuel combusted with compressed air in Kobayashi in order to provide electricity and providing means for raising the temperature of the reformer.

### ***Allowable Subject Matter***

Claims 10-17 are allowed.

The following is an examiner's statement of reasons for allowance: the prior art of record does not teach or suggest introducing a mixture of a fuel and an oxygen containing gas, at a pressure lower than in step (a) into the second end of the second zone for combustion and passage through the second and first zone thereby heating the first zone, wherein the second zone contains bed packing materials. Additionally, the

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prior art of record does not teach or suggest this feature in combination with the other limitations present in claim 10.

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

### ***Conclusion***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to PAUL A. WARTALOWICZ whose telephone number is (571)272-5957. The examiner can normally be reached on 8:30-6 M-Th and 8:30-5 on Alternate Fridays.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Stanley Silverman can be reached on (571) 272-1358. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Paul Wartalowicz  
December 17, 2009

/Steven Bos/  
Primary Patent Examiner  
AU 1793